REMARKS

This Amendment responds to the Office Action dated June 16, 2003 in which the Examiner rejected claims 1-15 under 35 U.S.C. §103.

As indicated above, claims 1 and 13 have been amended to make explicit what is implicit in the claims and to correct a grammatical error in claim 1. It is respectfully submitted that the amendment is unrelated to a statutory requirement for patentability and does not narrow the literal scope of the claims.

Claim 1 claims a method of automatically finding one or more answers to a natural language question in a computer stored natural language text database. The natural language text database has been analyzed with respect to syntactic functions of constituents, lexical meaning of word tokens, and clause boundaries. The natural language question comprises a question clause. The method comprises the steps of: first, analyzing a computer readable representation of the question clause with respect to syntactic functions of its constituents and the lexical meaning of its word tokens. In response to the analysis step, a set of conditions for a clause in the natural language text database is defined to constitute an answer to the question clause. The conditions comprise a condition stipulating that, for a clause in the natural language text database to constitute an answer to the questions clause, at least one of the constituents of the question clause should have a corresponding constituent in the clause having the same syntactic function and an equivalent lexical meaning. Clauses are identified in the natural language text database that

satisfy the conditions. Answers to the question clause are returned by means of the identified clauses that match the conditions.

Through the method of the claimed invention a) having a natural language text database which has been analyzed with respect to syntactic functions of constituents, lexical meaning of word tokens and clause boundaries and b) defining a set of conditions for a clause in the natural language text database to constitute an answer to a question clause where the conditions comprise a condition stipulating that, for a clause in the natural language text database to constitute an answer to the questions clause, at least one of the constituents of the question clause should have a corresponding constituent in the clause having the same syntactic function and an equivalent lexical meaning, as claimed in claim 1, the claimed invention provides a method of automatically finding one or more answers to a natural language question that are not domain specific and that deliver answers to questions with high precision. The prior art does not show, teach or suggest the invention as claimed in claim 1.

Claim 13 claims a system for automatically finding one or more answers to a natural language question in a computer stored natural language text database. The system comprises a storage means, analyzing means, defining means and answer finding means. The storage means comprises the natural language text database which has been analyzed with respect to syntactic functions of constituents, lexical meaning of word tokens, and clause boundaries. The analyzing means is for analyzing a computer readable representation of question clause of a natural language question with respect to syntactic

functions of its constituents and lexical meaning of its word tokens. The defining means, is operatively connected to the analyzing means, and is for defining, in response to an analysis performed by the analyzing means, a set of conditions for a clause in the natural language text database to constitute an answer to the question clause. The conditions comprise a condition stipulating that, for a clause in the natural language text database to constitute an answer to the questions clause, at least one of the constituents of the question clause should have a corresponding constituent in the clause having the same syntactic function and an equivalent lexical meaning. The answer finding means is operatively connected to the storage means and the defining means, and is for identifying in the natural language text database clauses that satisfy the conditions and is for returning answers to the question clause by means of the clauses that satisfy the condition.

Through the structure of the claimed invention having a storage means storing the natural language text database which has been analyzed with respect to syntactic functions of constituents, lexical meanings of word tokens and clause boundaries and having a defining means which defines a set of conditions for a clause in the natural language text database to constitute an answer to the question clause where the conditions comprise a condition stipulating that, for a clause in the natural language text database to constitute an answer to the questions clause, at least one of the constituents of the question clause should have a corresponding constituent in the clause having the same syntactic function and an equivalent lexical meaning, as claimed in claim 13, the claimed invention provides a system for automatically finding one or more answers to a natural language question that

are not domain specific and that deliver answers to questions with high precision. The prior art does not show, teach or suggest the invention as claimed in claim 13.

Claims 1 and 12-15 were rejected under 35 U.S.C. §103 as being unpatentable over *Goldberg et al.* (U.S. Patent No. 5,895,466) in view of *Julliard* (U.S. Patent No. 6,202,064).

Goldberg et al. appears to disclose in Fig. 2 at step 100, natural language device 30 receives a textual question from a customer at remote device 10. At step 110, natural language device 30 analyzes the question using natural language understanding software. The analysis includes a vocabulary analysis and a syntactic/semantic analysis of the textual question. At step 120, as a result of the analysis of step 110, natural language keys are generated and parameters, if any, are extracted from the text based question. The parameters are included in the text based question. At step 130, it is determined whether all parameters require by the question are received. The required parameters must be included with the keys when database 40 is queried. If all of the required parameters were determined not to be received at step 130, at step 140 natural language device 30 automatically generates a request to the customer for the missing parameters. If all of the required parameters were determined to be received at step 130, at step 150 database 40 is queried based on the keys generated and the required parameters extracted at step 120. Database 40 includes answers to all known possible customer questions. Previously unknown questions may not have answers stored on database 40 when they are first received by natural language device 30. If so, natural language device 30 will not receive

an answer as a result of the query at step 150. Therefore, at step 160 it is determined whether an answer has been received from database 40 based on the query at step 150. If it is determined that an answer was not received at step 160, the answer to the question will typically be manually generated by a customer service employee. This manual answer will be sent to the customer at remote device 10. In addition, at step 170 the manual answer is received by natural language device 30. At step 180, customer service system 50 is trained based on the manually generated answer. (col. 3, lines 1-64)

Thus, *Goldberg et al.* merely discloses that as a result of analyzing the question, using natural language understanding software in step 110, natural language keys are generated and parameters are extracted. Nothing in *Goldberg et al.* shows, teaches or suggests defining a set of conditions for a clause where the conditions comprise a condition stipulating that, for a clause in the natural language text database to constitute an answer to the questions clause, at least one of the constituents of the question clause should have a corresponding constituent in the clause having the same syntactic function and an equivalent lexical meaning, as claimed in claims 1 and 13. Rather, *Goldberg et al.* merely discloses generating natural language keys and extracting parameters from the text based question. In other words, the natural language keys used in *Goldberg et al.* are generated when queries are analyzed using the natural language device. The keys are merely pointers to answers in the database. The keys do not relate to the answers in the database in any way other then the fact that the answers are indexed to the keys. Thus *Goldberg et al.* does not show, teach or suggest that the keys comprise a condition stipulating that, for a

clause in the natural language text database to constitute an answer to the questions clause, at least one of the constituents of the question clause should have a corresponding constituent in the clause having the same syntactic function and an equivalent lexical meaning, as claimed in claims 1 and 13.

Additionally, *Goldberg et al.* merely discloses a database 40 which stores a plurality of answers to possible customer questions where the plurality of answers are indexed to natural language keys that are generated by natural language device 30 during the analysis of step 110. Thus nothing in *Goldberg et al.* shows, teaches or suggests a natural language text database which has been analyzed with respect to syntactic functions of constituents, lexical meaning of word tokens and clause boundaries as claimed in claims 1 and 13. Rather, the database 40 in *Goldberg et al.* merely stores a plurality of answers to possible customer questions. In other words, the answers in the database 40 in *Goldberg et al.* have not been analyzed with respect to syntactic functions of constituents, lexical meaning of word tokens and clause boundaries as claimed in claims 1 and 13.

Applicant respectfully submits that the *Goldberg et al.* system requires pre-generation of answers to potential questions and indexing them to natural keys. Thus, the system of *Goldberg et al.* is not able to dynamically find answers to new questions for which no answers have been stored and no keys have been indexed to these answers (see col. 3, lines 50-62). However, as claimed in claims 1 and 13, both the natural language text database and the question clause are analyzed with respect to their respective syntactic functions of constituents and lexical meaning of word tokens and answers are identified

based not only on predetermined indexing of a set of answers to keys but also on conditions on a clause in the natural language text database where the conditions comprise a condition stipulating that, for a clause in the natural language text database to constitute an answer to the questions clause, at least one of the constituents of the question clause should have a corresponding constituent in the clause having the same syntactic function and an equivalent lexical meaning. Therefore, the natural language text and database of the invention as claimed in claims 1 and 13 is not limited to a set of answers to potential questions but in fact may comprise any natural language text.

Julliard appears to disclose techniques for searching for information in a text database or corpus. (col. 1, lines 5-6) A method of searching for information in a text database, comprising: (a) receiving at least one user input, the user input(s) defining a natural language expression including one or more words, (b) converting the natural language expression to a tagged form of the expression, the tagged form including said one or more words and, associated therewith, a part-of-speech tag, (c) applying to the tagged form one or more grammar rules of the language of the natural language expression, to derive a regular expression, and (d) analyzing the text database to determine whether there is a match between said regular expression and a portion of said text database. Preferably, step (b) comprises the step of: tagging the natural language expression by, for each word in said natural language expression, (b1) converting each word to its root form, and (b2) applying a part-of-speech tag to each word, thereby generating a complex tagged form. Preferably, the part-of speech tag includes a syntactic category marker and a morphological

feature marker, and wherein step (b) further comprises the step of: (b3) simplifying said complex tagged form by removing each morphological feature marker, to generate said tagged form. (col. 1, line 16 through col. 2, line 21) FIG. 2 is a schematic flow diagram of the steps in carrying out a linguistic search. (col. 3, lines 1-2) Initially (step s1), the user specifies the multiword expression he is looking for. (col. 3, lines 7-8) Next, at step s2, the expression is then sent to a tagger (or disambiguation). The tagger does two things: 1) reduce each word to its root form and 2) determine the part-of-speech of each word. (col. 3, lines 13-20) Once the tagged form 50 has been obtained, it is then simplified, at step s3. (col. 3, lines 27-28) The process continues at step s4, in which the simplified tagged form 51 is operated on, given the grammar of a language it is possible to determine what kind of variations a multiword expression can undergo without changing its initial meaning. (col. 3, lines 34-38) The grammar rules expressed in step s4 are coded in a regular expression and matched against the simplified tagged form 51 of the user query. If one of those rules matches, then the simplified tagged form 51 of the user query transforms into a complex regular expression representing the grammar variations. (col. 4, lines 9-14) The matching regular expression 52 is then processed further at step s5. Once the final regular expression 52 has been generated it is matched against the tagged version of the corpus. (col. 4, lines 17-20) Step s6 is performed after the regular expression has been matched against the tagged version of the corpus. As mentioned above, the Perl (or awk) regular expressions mechanism can tell the user not only what string matches exist, but also where this string is located in the text. However, because the regular expression

matching is done on the tagged version of the corpus, the positioning information is not suitable for the original text. As a consequence, if it is desired to highlight the matches a way must be provided to go from the offset in the tagged text into the actual offset in the original text. Currently, this is made via a simple offset table built during the corpus tagging. (col. 5, lines 5-16)

Thus, *Julliard* merely discloses a retrievable system in which a query is entered and tagged with regular parts of speech and a regular expression is formed using grammatical rules. An information text database is then searched in *Julliard* for matches between the regular expression and a portion of the text database. Thus, although grammatical rules are used in *Julliard* to determined what kind of additional words, expressions or phrases may be present in a matched phrase, nothing in *Julliard* shows, teaches or suggests defining any condition with respect to the syntactic function of constituents for the matching of the search expression with the text to be searched. Specifically, nothing in *Julliard* shows, teaches or suggests a condition stipulating that, for a clause in the natural language text database to constitute an answer to a question clause, at least one of the constituents of the question clause should have a corresponding constituent in the clause having the same syntactic function and an equivalent lexical meaning as claimed in claims 1 and 13. Rather, *Julliard* merely discloses entering a query, tagging the words of the query with parts of speech, forming a regular expression using grammatical rules and then searching for matches in an information text database between the regular expression and a portion of the text database.

Since neither *Goldberg et al.* or *Julliard* shows, teaches or suggests defining a set of conditions for a clause where the conditions comprise a condition stipulating that for a clause to constitute an answer, at least one of the constituents of the question clause should have a corresponding constituent in a clause having the same syntactic function and an equivalent lexical meaning, as claimed in claims 1 and 13, it is respectfully requested that the Examiner withdraws the rejection to claims 1 and 13 under 35 U.S.C. §103.

Claims 12 and 14-15 depend from claims 1 and 13 and recite additional features. It is respectfully submitted that claims 12 and 14-15 would not have been obvious within the meaning of 35 U.S.C. §103 over *Goldberg et al.* and *Julliard* at least for the reasons as set forth above. Therefore, Applicant respectfully requests the Examiner withdraws the rejection to claims 12 and 14-15 under 35 U.S.C. §103.

Claims 2-10 were rejected under 35 U.S.C. §103 as being unpatentable over *Goldberg et al.* in view of *Julliard* and further in view of *Hedin et al.* (U.S. Patent No. 5,386,556).

Applicant respectfully traverses the Examiner's rejection of the claims under 35 U.S.C. §103. The claims have been reviewed in light of the Office Action, and for reasons which will be set forth below, Applicant respectfully requests that the Examiner withdraws the rejection to the claims and allows the claims to issue.

As discussed above, since nothing in *Goldberg et al.* or *Julliard* shows, teaches or suggests the primary features as claimed in claim 1, Applicant respectfully submits that the combination of the secondary reference of *Hedin et al.* was the primary references of

Goldberg et al. and *Julliard* would not overcome the deficiencies of the primary references. Therefore, Applicant respectfully requests the Examiner withdraws the rejection to claims 2-10 under 35 U.S.C. §103.

Claim 11 was rejected under 35 U.S.C. §103 as being unpatentable over *Goldberg et al.* in view of *Julliard* and *Hedin* and further in view *Voorhees* ("Using WordNet for Text Retrieval").

Applicant respectfully traverses the Examiner's rejection of claim 11 under 35 U.S.C. §103. The claim has been reviewed in light of the Office Action, and for reasons which will be set forth below, Applicant respectfully requests the Examiner withdraws the rejection to the claim and allows the claim to issue.

As discussed above, since nothing in the combination of *Goldberg et al.*, *Julliard* or *Hedin et al.* show, teach or suggest the primary feature as claimed in claim 1, Applicant respectfully submits that the combination of the primary references with *Voorhees* will not overcome the deficiencies of the primary references. Therefore, Applicant respectfully requests the Examiner withdraws the rejection to claim 11 under 35 U.S.C. §103.

Thus it now appears that the application is in condition for reconsideration and allowance. Reconsideration and allowance at an early date are respectfully requested.

If for any reason Examiner feels that the application is not now in condition for allowance, it is respectfully requested that the Examiner contact, by telephone, the applicant's undersigned attorney at the indicated telephone number to arrange for an interview to expedite the disposition of this case.

In the event that this paper is not timely filed within the currently set shortened statutory period, applicant respectfully petitions for an appropriate extension of time. The fees for such extension of time may be charged to our Deposit Account No. 02-4800.

In the event that any additional fees are due with this paper, please charge our Deposit Account No. 02-4800.

Respectfully submitted,

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